

REMARKS

The Official Action dated July 3, 2002 has been carefully considered. Accordingly, the changes presented herewith, taken with the following remarks, are believed sufficient to place the present application in condition for allowance. Reconsideration is respectfully requested.

By the present Amendment, claims 1, 8 and 15 have been amended to recite a conjugated diene as the monomer for polymerization inhibition. Additionally, claim 8 has been amended to define the phosphorous-containing compound in accordance with the teachings in the specification, for example in the paragraph bridging pages 27 and 28. A Version With Markings Showing Changes Made is attached. Claims 23-25 are added and contain limitations from claims 2 and 3 and from the specification, for example in the paragraph bridging pages 27 and 28. It is believed that these changes do not involve any introduction of new matter, whereby entry is believed to be in order and is respectfully requested.

In the Official Action, claims 8, 9 and 11-14 were rejected under 35 U.S.C. 102(b) as anticipated by the Mine et al U.S. Patent No. 5,856,662. The Examiner asserted that Mine et al disclose N-oxyl compound in combination with a phosphine compound.

However, Applicants submit that the polymerization inhibitors defined by claims 8, 9 and 11-14 are not anticipated by Mine et al. Accordingly, this rejection is traversed and reconsideration is respectfully requested.

More particularly, according to claim 8, the polymerization inhibitors according to the invention are for inhibiting polymerization of a conjugated diene and comprise at least one compound (a) selected from the group consisting of a compound having an NO radical in its molecule and a precursor compound capable of forming an NO radical, and a phosphorous-containing compound (b) in a weight ratio of (a):(b) of 1:10 to 100:1. The phosphorus-

containing compound (b) is selected from the group consisting of phosphoric compounds, esterified products of the phosphoric compounds, alkali metal salts or ammonium salts of the phosphoric compounds, compounds obtained by introducing an ester linkage and an alkali metal salt linkage or an ammonium salt linkage into the phosphoric compounds, and hexaalkylphosphorus triamides.

Mine et al disclose methods for inhibiting polymerization of (meth)acrylic acid or esters thereof using a N-oxyl compound represented by the formula set forth at column 2, line 16 in combination with phosphine compound or a cobalt compound. However, Applicants find no teaching or suggestion by Mine et al relating to a polymerization inhibitor for a conjugated diene, particularly comprising at least one compound (a) selected from the group consisting of a compound having an NO radical in its molecule and a precursor compound capable of forming an NO radical, and a phosphorous-containing compound selected from the group consisting of phosphoric compounds, the derivatives of phosphoric compounds recited in claim 8 and hexaalkylphosphorous triamides.

Anticipation under 35 U.S.C. §102 requires the disclosure in a single prior art reference of each element of the claim under consideration, *Alco Standard Corp. v. TVA*, 1 U.S.P.Q.2d 1337, 1341 (Fed Cir. 1986). In view of the failure of Mine et al to disclose a polymerization inhibitor for a conjugated diene and comprising at least one compound (a) and a phosphorous-containing compound (b) as required by claim 8, particularly in a weight ratio as specified in claim 8, Mine et al do not disclose each element of the claims under consideration and therefore do not anticipate claim 8, or claims 9, 11 and 12 dependent thereon. It is therefore submitted that the rejection under 35 U.S.C. §102 based on Mine et al has been overcome. Reconsideration is respectfully requested.

Claims 1-7, 10 and 15-22 were rejected under 35 U.S.C. 103(a) as being unpatentable over Mine et al, and further in view of the Parker et al U.S. Patent No. 5,155,148. The

Examiner relied on Parker et al as disclosing hydroxydiphenylamines in combination with 2,2,6,6-tetramethyl-4-hydroxypiperidine-4-oxyl as polymerization inhibitors. The Examiner asserted that the comparative data in the specification had been reviewed but was narrower in scope than the pending claims and could not be relied upon to show unexpected results.

However, Applicants submit that the polymerization-inhibiting compositions defined by claims 1-6, the polymerization inhibitor defined by claim 10, dependent on claim 8, and the methods for inhibiting polymerization defined by claims 15-20 and 22 are nonobvious over and patentably distinguishable from Mine et al in view of Parker et al. Accordingly, this rejection is traversed and reconsideration is respectfully requested.

According to claim 1, the invention is directed to polymerization-inhibiting compositions comprising at least one compound (a) selected from the group consisting of a compound having an NO radical in its molecule and a precursor compound capable of forming an NO radical, a phosphorous-containing compound (b), and a conjugated diene, wherein the weight ratio of (a) to (b) is 1:10 to 100:1. The combination of compound (a) and (b) in the specified weight ratio inhibits polymerization of the conjugated diene. As noted above, claim 8, on which claim 10 depends, is directed to polymerization inhibitors. According to claim 15, the invention is directed to methods for inhibiting polymerization, which methods comprise causing at least one compound (a) selected from the group consisting of a compound having an NO radical in its molecule and a precursor compound capable of forming an NO radical, and a phosphorous-containing compound (b) to coexist with a conjugated diene in a weight ratio of (a) to (b) of 1:10 to 100:1.

As noted above, Mine et al disclose a method for inhibiting the polymerization of (meth)acrylic acid or esters thereof. However, Applicants find no teaching or suggestion by Mine et al of a conjugated diene-containing composition as recited in claim 1, a combination of inhibitors (a) and (b) as recited in claims 8 and 10, or of a method for inhibiting the

polymerization of a conjugated diene as recited in claim 15. The polymerization-inhibiting compositions, the polymerization inhibitors and the method for inhibiting polymerization according to the present invention are particularly effective for inhibiting polymerization of a conjugated diene, specifically the formation of a popcorn polymer and a rubbery polymer in production processes for purified conjugated diene which comprise isolating conjugated diene by conducting a distillation process including extractive distillation from a conjugated diene-containing hydrocarbon mixture. Additionally, the results shown in the present specification demonstrate that the improvements provided by the presently claimed polymerization-inhibiting compositions and methods are significant and unexpected. Mine et al neither teach nor suggest the claimed compositions or methods, or that the presently claimed polymerization-inhibiting compositions and methods would have the demonstrated superior results as compared to the prior art.

Moreover, the deficiencies of Mine et al are not resolved by Parker et al. That is, Parker et al disclose polymerizable esters containing derivatives from p-hydroxydiphenylamine which are useful in the stabilization of oxidizable organic materials such as rubber, oils and the like. Specifically, Parker et al disclose that their invention relates to the stabilization of polymeric materials that are subjected to oxidative degradation and that conventional polymerization inhibitors such as alkylatedhydroxylamines, 2,2,6,6-tetramethyl-4-hydroxypiperidine-4-oxyl, and the like may be used to inhibit the polymerization of the esters of formula IV. However, Applicants find no teaching in Parker et al relating to polymerization-inhibiting compositions containing a conjugated diene as recited in claim 1, relating to polymerization inhibitors comprising a combination of compounds (a) and (b) as recited in claims 8 and 10, or relating to methods for inhibiting polymerization of a conjugated diene as recited in claim 15. Thus, even if one were to combine the teachings of Parker et al with Mine et al, the resulting compositions would not result in the combination of

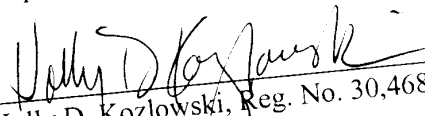
inhibitors (a) and (b) as required by claims 1, 8 and 15, particularly in further combination with a conjugated diene as required by claims 1 and 15.

References relied upon to support a rejection under 35 U.S.C. §103 must provide an enabling disclosure, i.e., they must place the claimed invention in the possession of the public, *In re Payne*, 203 U.S.P.Q. 245 (CCPA 1979). In view of the failure of Mine et al and Parker et al to teach or suggest polymerization inhibition of a conjugated diene, particularly using a combination of compounds (a) and (b) as respectively defined in claims 1, 8 and 15, the combination of Mine et al and Parker et al does not provide an enabling disclosure of the presently claimed compositions and methods and does not place the claimed invention in the possession of the public. Thus, the combination of Mine et al and Parker et al does not support a rejection of the present claims under 35 U.S.C. §103.

It is therefore submitted that the compositions and methods defined by present claims 1-6, 10, 15-20 and 22 are nonobvious over and patentably distinguishable from the cited combination of the references, and that the rejection under 35 U.S.C. 103 has been overcome. Reconsideration is respectfully requested.

It is believed that the above represents a complete response to the rejections set forth in the Official Action, and places the present application in condition for allowance. Reconsideration and an early allowance are requested.

Respectfully submitted,


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VERSION WITH MARKINGS SHOWING CHANGES MADE

Claims 1, 8 and 15 are amended as follows:

1. (Amended) A polymerization-inhibiting composition comprising at least one compound (a) selected from the group consisting of a compound having an NO radical in its molecule and a precursor compound capable of forming an NO radical, a phosphorus-containing compound (b), and [at least one monomer (c) selected from the group consisting of] a conjugated diene[, an aromatic vinyl, an ethylenically unsaturated nitrile and an α -olefin], wherein a weight ratio of the compound (a) to the phosphorus-containing compound (b) is 1:10 to 100:1.

8. (Amended) A polymerization inhibitor for [at least one monomer (c) selected from the group consisting of] a conjugated diene, [an aromatic vinyl, an ethylenically unsaturated nitrile and an α -olefin,] comprising at least one compound (a) selected from the group consisting of a compound having an NO radical in its molecule and a precursor compound capable of forming an NO radical, and a phosphorus-containing compound (b) selected from the group consisting of phosphoric compounds, esterified products of the phosphoric compounds, alkali metal salts of the phosphoric compounds, ammonium salts of the phosphoric compounds, compounds obtained by introducing an ester linkage and an alkali metal salt linkage into the phosphoric compounds, compounds obtained by introducing an ester linkage and an ammonium salt linkage into the phosphoric compounds, and hexaalkylphosphorus triamides, wherein a weight ratio of the compound (a) to the phosphorus-containing compound (b) is 1:10 to 100:1.

15. (Amended) A method for inhibiting polymerization, which comprises causing at least one compound (a) selected from the group consisting of a compound having an NO

radical in its molecule and a precursor compound capable of forming an NO radical, and a phosphorus-containing compound (b) to coexist at a weight ratio of the compound (a) to the phosphorus-containing compound (b) of 1:10 to 100:1 with [at least one monomer (c) selected from the group consisting of] a conjugated diene[, an aromatic vinyl, an ethylenically unsaturated nitrile and an α -olefin].

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